Chapter 4. Chlorophyll and Phytoplankton Community Composition, 1997-2000

Pursuant to the monitoring mandate of D-1641, the Department of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) collect phytoplankton and chlorophyll samples throughout the upper San Francisco Estuary (Estuary). This chapter describes the chlorophyll *a* concentration and phytoplankton community composition measurements obtained from calendar years 1997-2000 in the upper Estuary.

Samples for chlorophyll *a* analysis and phytoplankton samples for identification and enumeration were collected at 11 stations (Figure 4-1). For this summary, stations were grouped into regions according to the results of previously published hierarchical cluster analysis of Environmental Monitoring Program (EMP) data (DWR 2001). Chlorophyll *a* was filtered from samples using a fiberglass filter (47-mm diameter, pore size 1.0 µm) at a vacuum pressure of 10 inches of mercury immediately after sampling. Chlorophyll *a* analyses were completed at DWR's Bryte Laboratory according to standard methods (APHA 1998). Phytoplankton identification and enumeration were also performed at Bryte Laboratory using the Utermohl inverted microscope method at a magnification of 700x with a 40x objective and a 10x eyepiece. For more information about the methods for identification and enumeration refer to DWR's report *Water Quality Conditions in the Sacramento-San Joaquin Delta During 1996* (2001).

Figures 4-2 through 4-5 display the results of chlorophyll *a* and pheophytin analysis. Chlorophyll *a* concentrations for 1997-2000 were below 10 µg/L for most regions. Concentrations commonly ranged between 0.5 µg/L and 15 µg/L throughout the estuary. In 1996, chlorophyll levels were below 7 µg/L for all stations with the exception of the southern Delta and San Pablo Bay, which both peaked below 20 µg/L (DWR 2001).

The highest chlorophyll *a* concentrations occurred between March and June in the north Delta, lower Sacramento River, Suisun Bay, and lower San Joaquin River. The highest chlorophyll *a* concentration for the central, west, east, and south Delta regions occurred during July or September. The San Pablo Bay region was unique with a maximum biomass increase during April and July.

Phytoplankton species composition changes seasonally due to the interaction of many factors. Changes in water inflows, turbidity, light penetration, nutrients, water temperature, salinity, and other water quality parameters are all probable factors that contribute to changes in phytoplankton species composition. Diatoms comprised the spring chlorophyll *a* maximum and flagellates comprised the summer maximum in the north Delta, lower Sacramento River, lower San Joaquin River, central Delta, south Delta, and the east Delta. The chlorophyll *a* maximum consisted of miscellaneous flagellates, the crytophyte *Cryptomonas ovatas,* and the diatoms *Skeletonema sp.* and *Aulacosira granulate,* in Suisun Bay, as well as miscellaneous flagellates and various diatoms in San Pablo Bay.

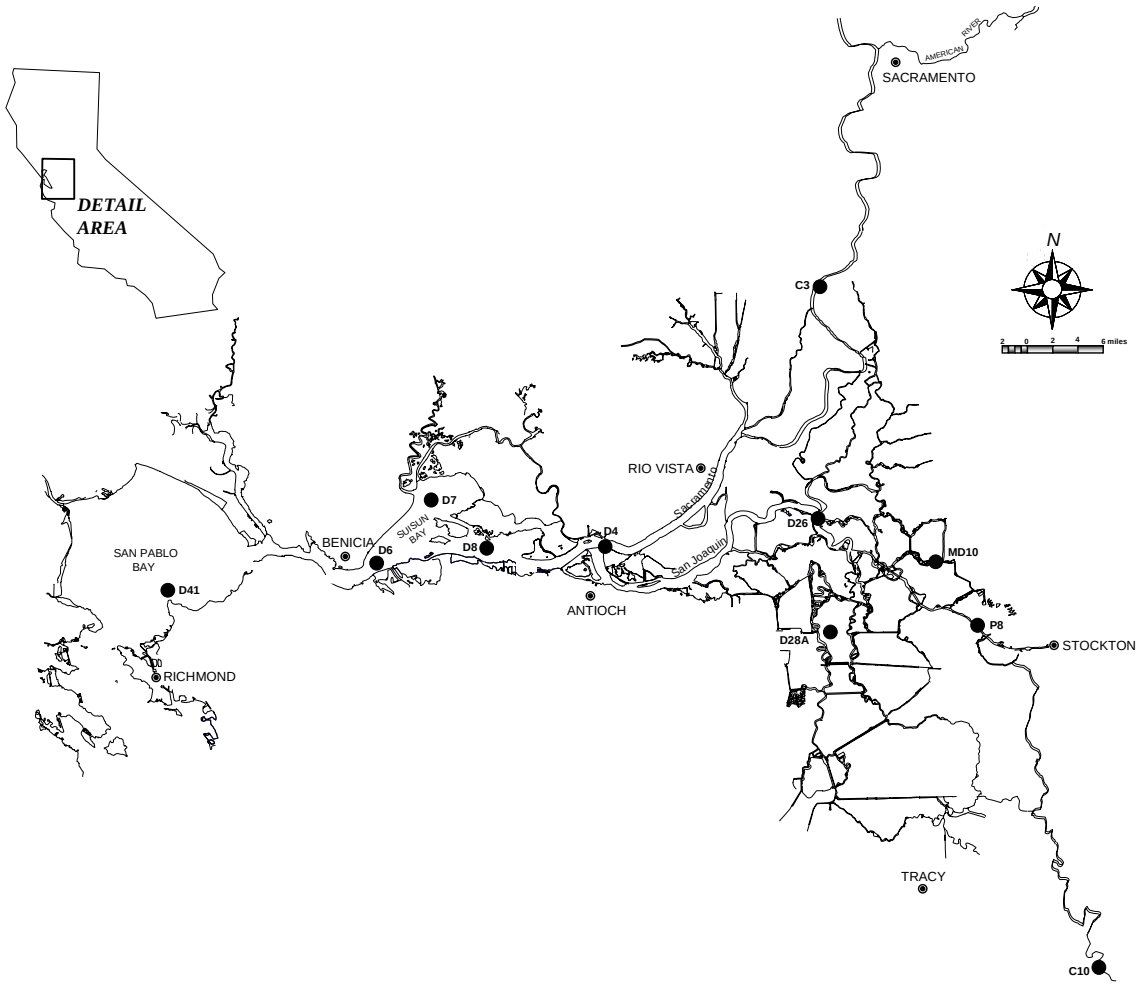

Figure 4-1 Map of chlorophyll and phytoplankton monitoring stations

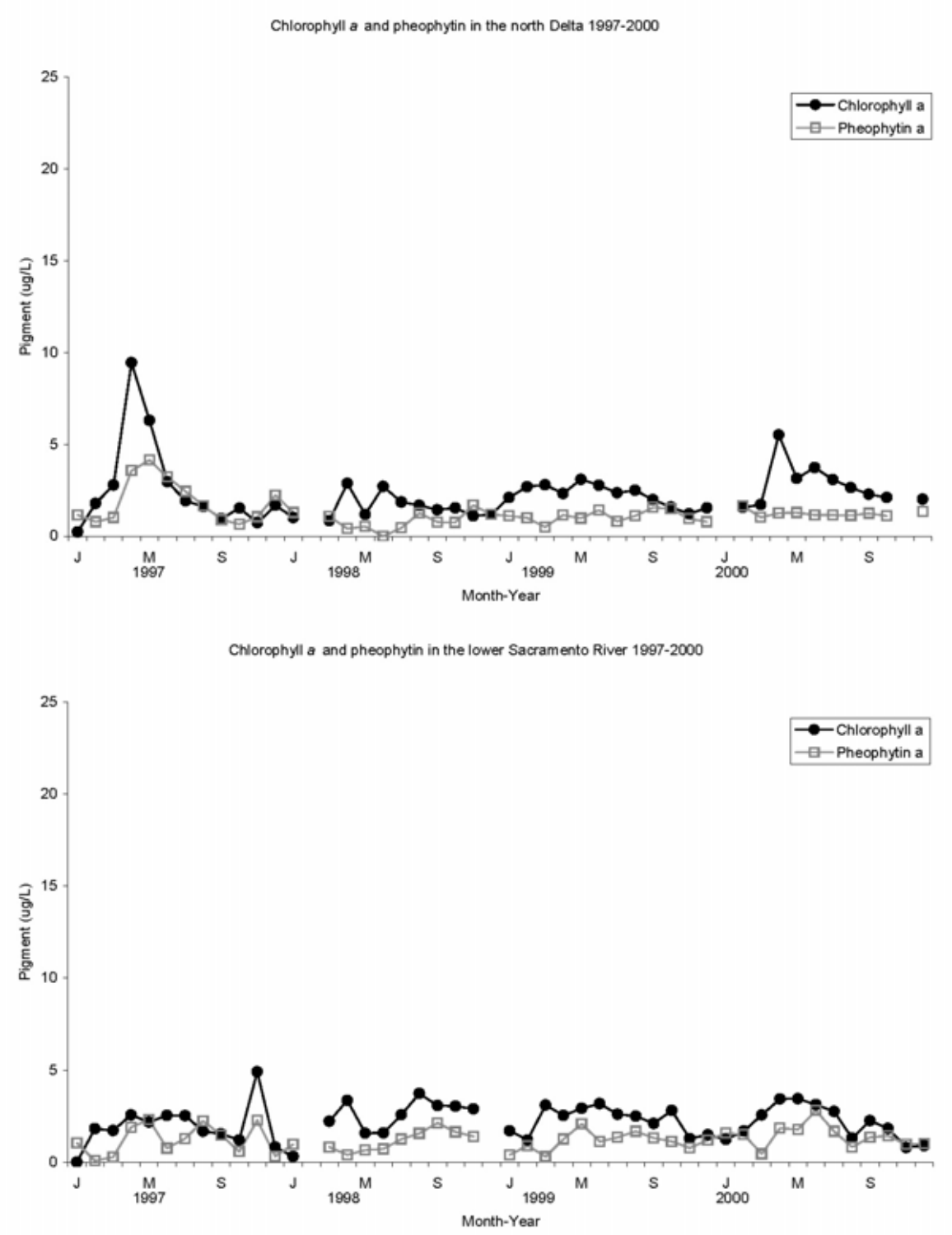

Figure 4-2 Chlorophyll *a* and pheophytin in the north Delta and lower Sacramento River, 1997-2000

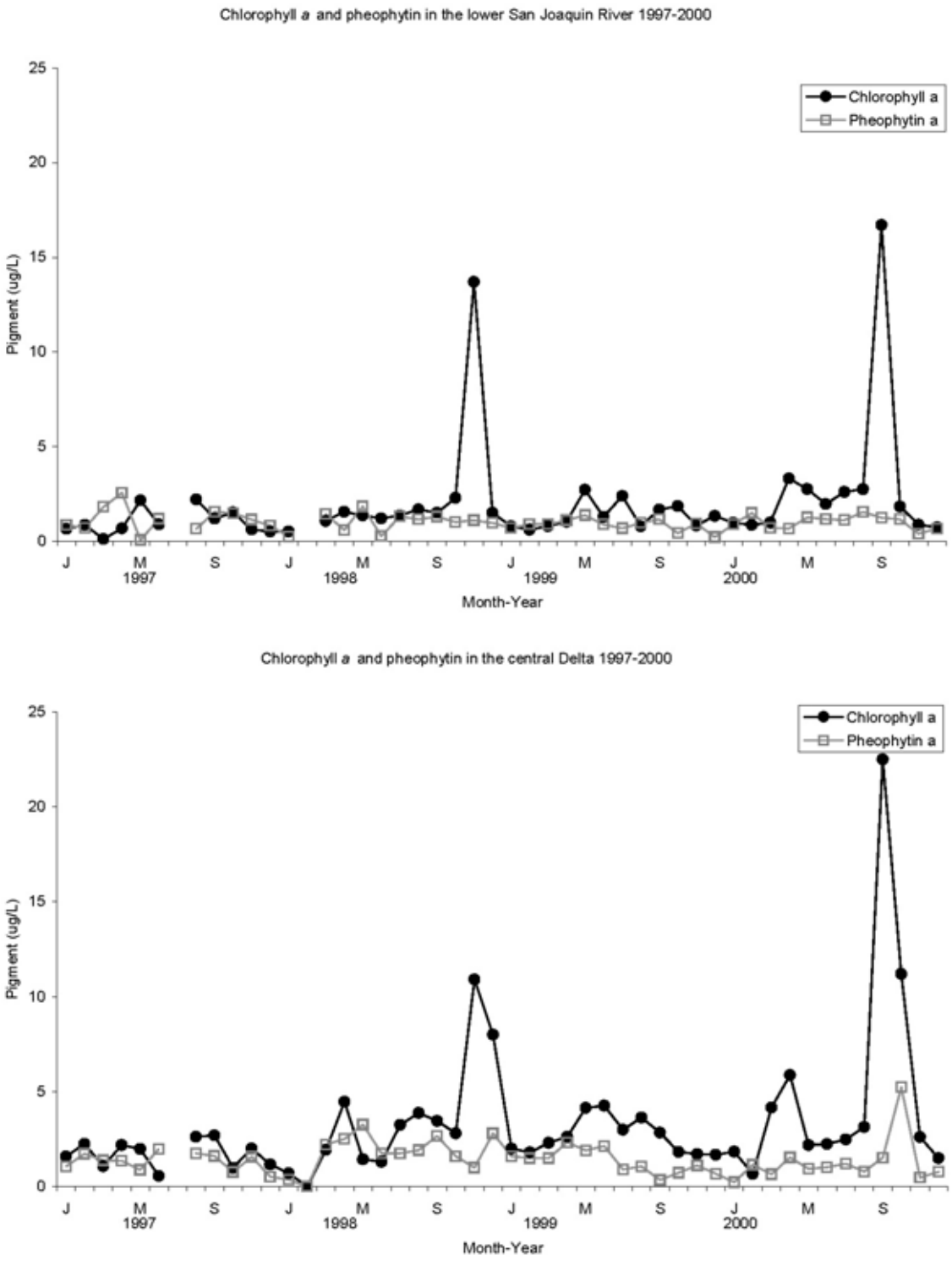

Figure 4-3 Chlorophyll *a* and pheophytin in the lower San Joaquin River and central Delta, 1997-2000

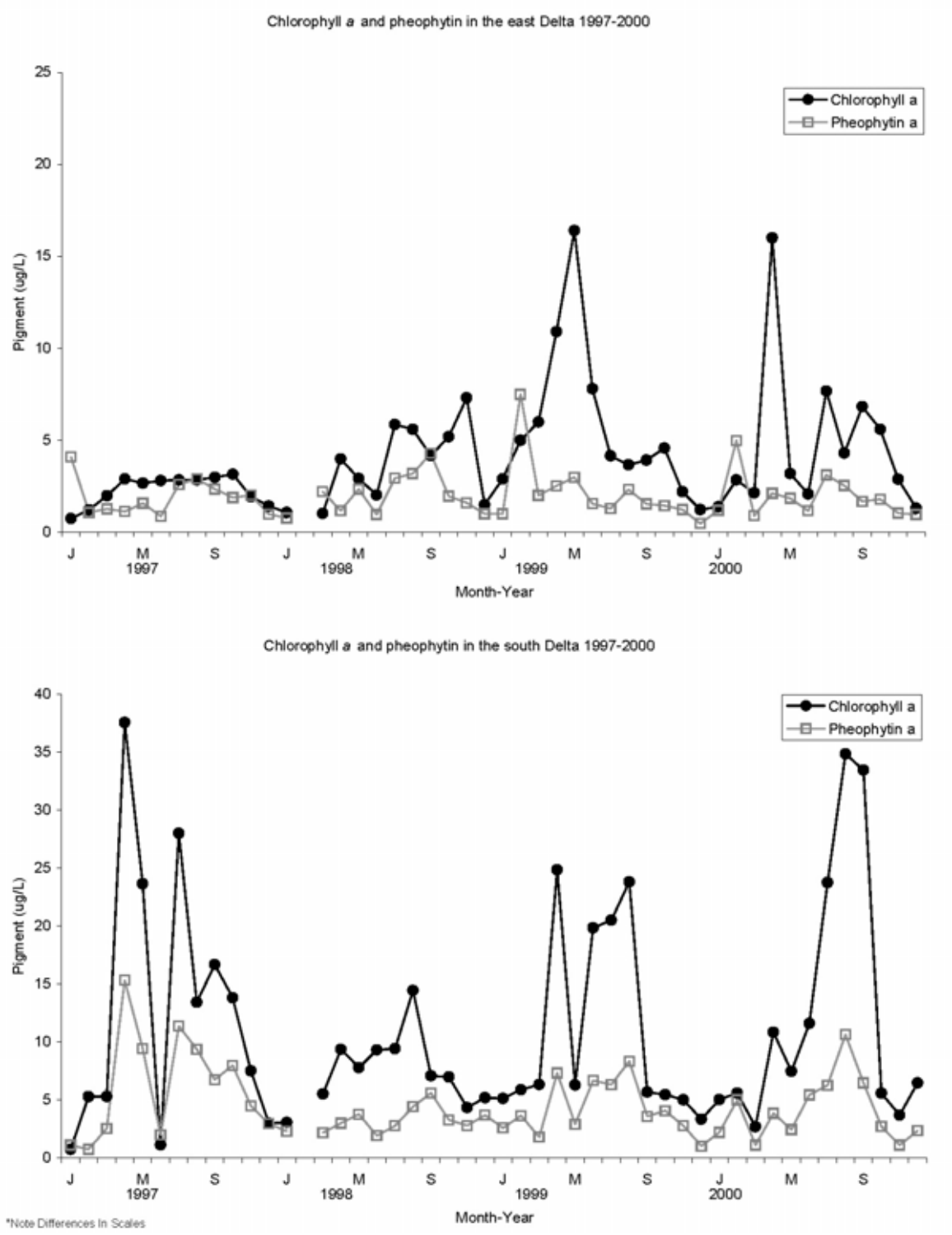

Figure 4-4 Chlorophyll *a* and pheophytin in the east Delta and south Delta, 1997-2000

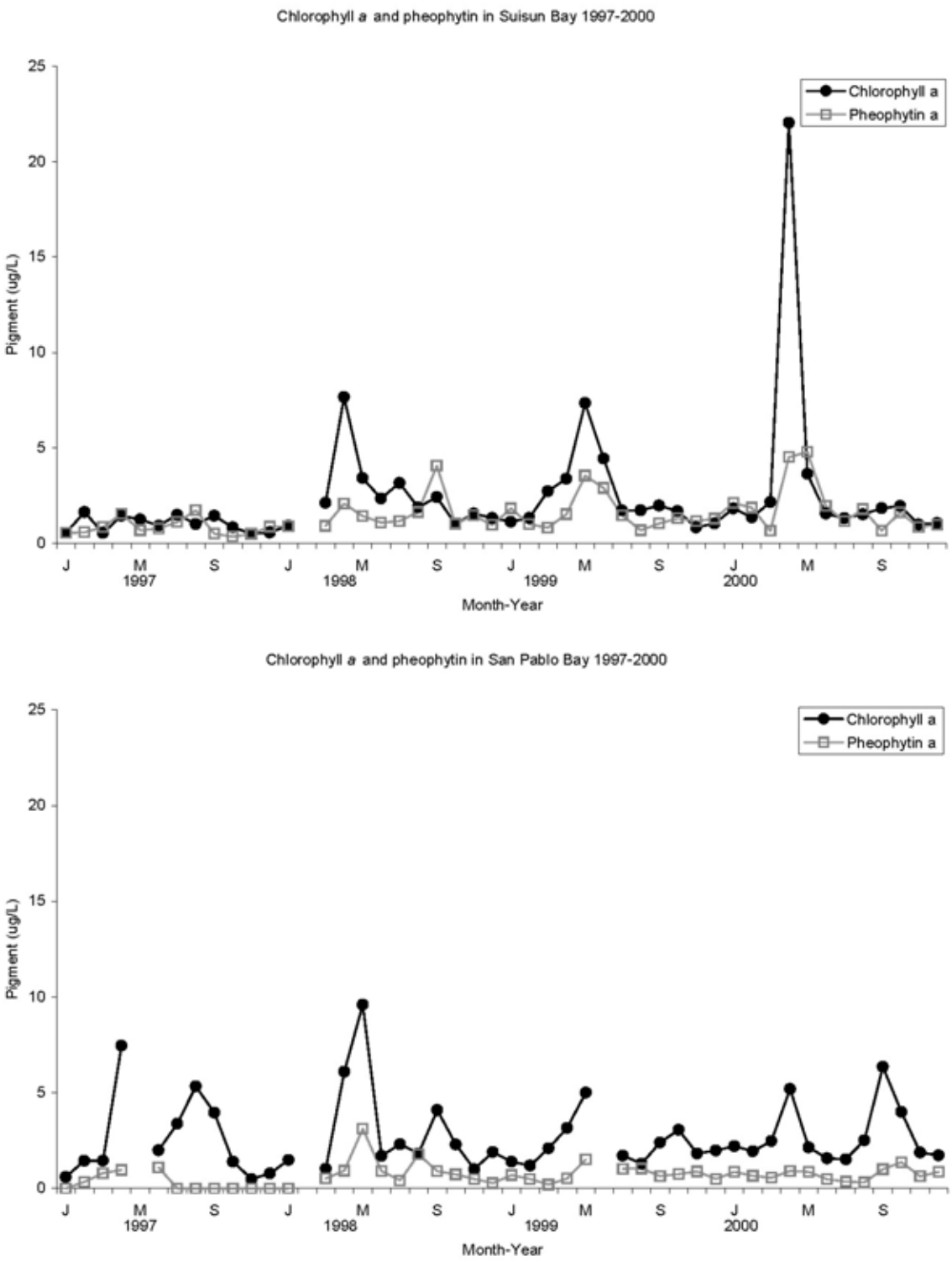

Figure 4-5 Chlorophyll *a* and pheophytin in Suisun and San Pablo bays, 1997-2000